THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

This opinion (1) was not written for publication and (2) is not binding precedent of the Board.

Paper No. 20

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MOTOJI YAGURA,
MASANORI KOMINAMI, TOSHIAKI KINOSADA,
KOKEN YOSHIKAWA, and JOHN K. TWYNAM

Appeal No. 95-5148
Application No. 08/121,794[1]

ON BRIEF[2]

Before KRASS, LEE, and TORCZON, Administrative Patent Judges.

TORCZON, Administrative Patent Judge.

DECISION ON APPEAL

BACKGROUND

This is an appeal under 35 U.S.C. § 134 from the final rejection of claims 1-5. We reverse and enter a new ground of rejection under 37 CFR § 1.196(b).

The application is entitled "Ohmic electrode structure". The subject matter of the invention is illustrated in

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[1] Attorney docket no. 25417-2000100

[2] Counsel waived a scheduled hearing. (Paper 19.)

Figures 3 and 4 and is broadly represented by claim 1, the sole independent claim:

> An ohmic electrode structure having a layered structure comprising:
>
> a compound semiconductor;
>
> an $In_xGa_{1-x}As$ layer ($0 < x \# 1$) on said compound semiconductor;
>
> a metal layer including at least one metal sublayer; and
>
> a barrier layer between said metal layer and said $In_xGa_{1-x}As$ layer for prevention of the diffusion of metallic components between said metal layer and said $In_xGa_{1-x}As$ layer;
>
> said barrier layer being composed of a metallic nitride having a high melting point and providing an ohmic interface with said $In_xGa_{1-x}As$ layer.

The examiner rejected all of the claims on appeal as unpatentable in view of the admitted prior art (Paper 1 at 1-3; Figs. 1 & 2) and the following Japanese kÇkai:[3]

Yamagishi 昭62-213158 pub'd. 19 Sept. 1987

In the answer, the examiner also relied heavily on

Marc Wittmer, "Barrier layers: Principles and applications in microelectronics", 2 J. Vac. Technol. 273-80 (Apr.-June 1984) (Wittmer)

but the examiner never positively recited Wittmer as part of the rejection. We, therefore, do not rely on Wittmer in

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[3] We rely on a translation (attached) for our understanding of this reference.

reviewing the rejection as stated. In re Hoch, 428 F.2d 1341, 1342 n.3, 166 USPQ 406, 407 n.3 (CCPA 1970).

The admitted prior art teaches all of the essential claim limitations in the claimed relationships except a barrier layer "composed of a" high melting point metallic nitride (claim 1, emphasis added) "with an amorphous structure" (claim 5). According to the specification, "metallic nitrides having high melting points assume amorphous structures" (Paper 1 at 4:15-16), so the only remaining question is whether Yamagishi teaches or suggests adding or substituting a barrier layer composed of a metallic nitride having a high melting point.

Yamagishi is directed to a Schottky junction (p. 3), not an ohmic contact. Although the fields of endeavor are related (metal/semiconductor junctions), they are distinct.[4] Yamagishi notes that both silicides and nitrides have been used to form gate electrodes for self-matching field-effect transistors (FETs). (p. 3.) His refinement is to use two nitrides--tungsten nitride (WN) and tantalum nitride (TaN)--as a laminate to form the gate. (p. 4-5; Fig. 2(b).)

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[4] Wittmer indicates, however, that the barrier height of Schottky junctions is "a very sensitive indicator of interfacial changes" at the metal/semiconductor interface. (p. 276.)

DISCUSSION

We are unpersuaded, based on the record before us, that the combination of the admitted prior art and Yamagishi would have rendered the subject matter of the claims obvious. Yamagishi's suggestion to use a WN/TaN laminate is an empirical solution to a specific problem. The examiner has not convincingly explained why a person having ordinary skill in the art would have been motivated to try a single nitride, e.g., WN (not TaN or WN/TaN), as a barrier layer in the admitted prior art. The analysis the examiner presented appears to be impermissible hindsight.

NEW GROUND OF REJECTION

Although the examiner never makes a rejection based on Wittmer, the combination of Wittmer and the admitted prior art strongly suggests the claimed invention. Wittmer teaches that at high temperatures the metallic layer (in his case, aluminum (Al)) decomposes, and forms compounds with, silicides. (p. 276.) For this reason, he reports that "transition metal silicides cannot be used as barrier material." (p. 279, emphasis added.) In contrast, Wittmer teaches that "[t]he performance of [another material] is only surpassed by refractory metal nitride barriers, such as TiN and ZrN." (Id., emphasis added.) TiN (titanium nitride) is in

Appellants' claimed Markush group of nitrides (claim 2), but the teaching is broad enough to cover all refractory metal nitrides, of which Wittmer considers TiN representative (p. 278). Wittmer identifies the other members of the claimed Markush group, tungsten (W) and molybdenum (Mo), as refractory metals (e.g., p. 277, Table II). A person having ordinary skill in the art contemplating the combination of the admitted prior art and Wittmer would have been inexorably drawn to the claimed subject matter.

DECISION

The examiner's rejection of all claims on appeal is reversed. We enter a new ground of rejection for claims 1-5 as unpatentable under section 103 in view of the admitted

prior art and Wittmer. Appellant should note that a new ground of rejection is not final for purposes of judicial review.

WITHIN TWO MONTHS FROM THE DATE OF THIS DECISION, Appellants must either:

1) submit an appropriate amendment of the claims so rejected or a showing of facts relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the application will be remanded to the examiner; or

2) request a rehearing on the same record.

See 37 CFR §§ 1.196(b) & 1.197(b). No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a). 37 CFR § 1.136(b).

REVERSED; 37 CFR § 1.196(b)

ERROL A. KRASS Administrative Patent Judge	)	
JAMESON LEE Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES

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RICHARD TORCZON)
Administrative Patent Judge)

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